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ANNOUNCEMENT.—Before proceeding to the business of the evening, SIR RODERICK MURCHISON called attention to the appeal which had been made to the scientific men of all countries in favour of the Humboldt Foundation at Berlin. The object of the appeal had been misunderstood. It was supposed to be to one country in Germany only. Far from it. It was an appeal to the civilized world—an appeal to every man who had a feeling of respect for the grand researches in which that great man, Alexander de Humboldt, was so long occupied. It was impossible to overestimate in this assembly the importance of a testimonial, the object of which was to encourage and support travels in remote parts by men of all nations, and thus to promote geographical science. General Sabine had written the following letter to the President, which he (Sir R.) would read to the meeting:—

"*To the Earl de Grey and Ripon, President of the Royal Geographical Society.*

"13, Ashley-place, January 7, 1860.

"MY LORD,—I beg to enclose fifty copies of the circular of the Berlin Committee of the Humboldt Foundation for distribution (should that step be approved) amongst the members of the Royal Geographical Society. I am aware that your Lordship has already notified your intention of subscribing very handsomely. Should any of the members of the Royal Geographical Society be disposed to subscribe, I shall be very happy to save them the trouble of the transmission of their subscriptions to Berlin, communicating their names either as individuals or as Fellows of the Royal Geographical Society, as they may desire.

"I remain your Lordship's obedient servant,

"EDWARD SABINE."

The subject of the Humboldt testimonial was brought before the British Association for the Advancement of Science at Aberdeen, and a subscription was opened, and liberally headed by its President, the Prince Consort; and having long had the honour of presiding over the Royal Geographical Society of London, he, Sir Roderick, having warmly co-operated, hoped that his associates would readily join in the contributions to carry out this great object.

The Papers read were—

1. *Proposed Railway Route across the Andes from Caldera to Rosario, viâ Cordova.* By W. WHEELWRIGHT, Esq., F.R.G.S.

THE author reminds us that he has been engaged, for many years, in introducing and constructing railways in the mountainous and broken country of Chile, where he has successfully adopted that system of steep gradients and sharp curves which he relies upon in his present proposal, of crossing the Andes by the San Francisco Pass.

The entire distance from the Pacific on the one side to a water communication with the Atlantic on the other, by the proposed route, is about 1000 miles, which may be divided into the following sections:—

		Miles.
1.	Port of Rosario, on the La Plata, to Cordova	250
2.	Cordova to the eastern base of the Andes	350
3.	Eastern base of the Andes to Junction with Tres Puntos Railway	320
4.	Junction with Tres Puntos Railway to Caldera	80
	Total length	1000

As regards the first section; a district of 6 miles in breadth, along its entire length, has been granted by the Argentine Confederation. This land is good for arable purposes, and not to be excelled for grazing.

The second section is still a gradually rising plain, and passes through a region of great wealth, pastoral, agricultural, and mineral. A concession of 3600 square miles has been made here, to the railway.

The third is barren waste throughout, and would depend for its support upon the through traffic. The San Francisco Pass is believed to be always open. For the last nine years it has never been closed by snow. The La Rosas Pass had been examined, but was considered inferior to the San Francisco.

The nature of the difficulties Mr. Wheelwright proposes to cope with are expressed as follows, in the report of his own surveyor:—

> "The first point at which the gradient begins to assume a serious character is at the junction of the San Andres and Saipote valleys. Here we find water and vegetation, and for 10 miles the surface of the ground is much cut up and broken by the stream passing through it, and by the débris from the small ravines on either side. Until we reach Maricunga, after leaving the 10th mile, we find but little or no vegetation and no obstruction to a railway, with the exception of a possible tunnel 500 feet in length. This tunnel might be found to be unnecessary upon further inspection. Just beyond Maricunga commence the most serious gradients, and a tunnel of more than half a mile in length will be needed to pass from Moreno's valley to the main valley, but the rest of the work to the Cuesta de los Chilenos will be trifling. To pass the Cuesta another tunnel will be needed, on a grade of 100 feet to the mile; and its length, for the purposes of estimating, might be stated at 2 miles, although I am inclined to think that an instrumental location would reduce it to one-half. We are now on the central plateau of the Andes. From Laguna Salada to the Rio Llama we rise for 18 miles at the rate of 2 feet per mile, and then, according to the Table, we have a gradient of 619 feet per mile for 3 miles. This, however, could easily be reduced to 200 feet per mile by projecting the line farther to the south, and following the bank of the stream, thus increasing the length to 9 miles instead of 3 miles as it now stands. This heavy gradient has been necessary to reach the plains of Tres Cruces, about 30 miles long and 10 miles broad. We pass through the centre of them over a gently rolling surface for 10 miles, when we bear more to the eastward for the Barancas de las Llamas. These Barancas are a spur from the Las Llamas mountains, and extend quite across the plain to the Volcano range on the other side, and serve as a barrier between the Tres Cruces and

Las Llamas plains. In order to give rise from one plain to the other, heavy works and rather abrupt gradients would be needed; but an instrumental survey would be necessary to determine the character of this work. From this point we fall gradually to the 'Barancas Blancas,' and then rise again to 'Laguna Verde,' the level of which I have assumed at 14,921 feet above the sea. Although the road just described is perfectly practicable, yet a preferable location for gradients, though a more expensive one, could be obtained by keeping more to the north, and skirting the base of the volcanic range, with a gradually ascending gradient, and thus overcome part of the rise of the pass of 'San Francisco.'

"But assuming that it is necessary to pass the level of 'Laguna Verde,' we then have an average rise to the summit of the Pass of but 66 feet per mile for 16½ miles. The descending gradient from here to the 'Sunto del Francisco' is 180 feet to the mile, but, as the location of the railway would be to the north, keeping up along the base of the mountain, an average gradient of 140 feet per mile would be sufficient; while the extreme gradient for overcoming this pass on a straight line, or, in other words, the natural rise of the ground is in no place over 300 feet per mile. From the great width of the pass it is but reasonable to suppose that the gradient could be much reduced by location.

"From 'El Sunto del San Francisco' to Fiambala we find no impediment, with the exception of the Angostura of the 'Las Losas' river, where the stream descends rather abruptly for 5 miles. But I am led to think that a more thorough examination of the country would endorse the opinion that a better line could be found by leaving the valley of Las Losas at Chouchonil and following another valley that joins the Fiambala valley a short distance above the Copacabana, at a town called Suesto."

The CHAIRMAN, in returning thanks to Mr. Wheelwright, observed that the author was well known as having devoted many years of his life to the promotion of commerce in South America. He was the first person to establish steam-navigation in the Pacific, and also to point out and realise the advantages of the transit across the isthmus of Panama. These facts would satisfy them that his paper was not the production of a mere speculator, but contained the project of a man thoroughly acquainted with the material interests of the South-American continent. He proposed to carry a railroad over an altitude equal to the summit of Mont Blanc, by taking advantage of a depression or low passage in that gigantic range of mountains, the Andes. He left it, of course, to practical engineers to speak upon the practicability of such a railroad.

ADMIRAL R. FITZROY, F.R.G.S., had known Mr. Wheelwright for more than a quarter of a century, and he believed there was not a more reliable, discreet, and enterprising person in whom scientific or commercial men might repose confidence. It was in 1834 that Admiral FitzRoy first became acquainted with him in Chile, when he was collecting information with the view of establishing steam communication along the shores of Chile and Peru, and eventually crossing the isthmus of Panama and connecting that isthmus, by steam, with England. At that time Mr. Wheelwright was thought a visionary speculator. A few years passed, and by his own perseverance he gradually established that Pacific coast communication, which, it was well known, had succeeded, and which in the sequel had led to the present communication by steam between the West Indies and the isthmus of Central America with Europe. After establishing steam communication along the coasts of Chile and Peru, he persuaded the Chilian government, assisted by British merchants chiefly, to undertake a railway communication between Valparaiso and Santiago de Chile; and that, too, had succeeded. Since then he had been engaged in establishing railway communication from the harbour of Caldera to the city of Copiapo, and subsequently to a town about thirty miles farther inland than Copiapo, making about eighty miles from the sea. He had carried this line to between 5000 and 6000 feet above the level of the sea—an elevation higher than had been so attained in any other part of the world. From that elevation, up to which locomotive engines were now at work, he had found that practicable gradients could be carried to a height of 16,000 feet above the level of the sea. From that point, after some level space, there was one continued and very gradual slope to the town of Rosario on the river Parana. From Rosario (on the east), sloping thus gradually to the eastern foot of the Cordillera of the Andes, there was scarcely any impediment of nature. Wood and water were abundant, the country was fertile, the climate was healthy, and there were no Indians to molest white people. In short, there was only the employment of capital and adequate encouragement required to carry that portion of the railway to the eastern summit of the Cordillera; and chiefly because on this east side the land slopes so gradually up to within a comparatively short distance of the summit.

For the character of the measurements, so far as barometrical altitudes and distances went, he could vouch that they had been correctly calculated with the proviso of a certain reasonable allowance for small errors in the horizontal distances, which, in so great a length, would not tell much, as the extremes were fixed accurately. The great difficulty of the undertaking lay between the summit of the Cordillera and the highest point at present gained westward of the Andes, between the point 6000 feet above the sea and the summit level of 16,000 feet. Mr. Wheelwright said (from information he had obtained) that there would not be much difficulty, in the opinion of practical miners, and of the engineers already employed on the Copiapo Railway, with respect to the gradients and the nature of the country. There would be less difficulty there than had been already surmounted.

But the commercial part of the question was a very different matter. The practicability of the scheme was based upon the supposition that the materials, and the men, and the money were available.

There was one remarkable feature in the San Francisco Pass, through which it was proposed to take the railway. It was the best pass in the whole range of the Chilian Cordillera of the Andes, and the only one practicable throughout the whole of the year. It was never snowed up; the climate was mild (in 27° s. lat.), so that the snow never lay sufficiently deep to cause an obstacle, nor were the winds or even storms sufficient to drive such quantities of snow into the hollows as to blockade the pass. The pass of the Cumbre, about 11,000 feet in height, nearly opposite to Valparaiso, and another 13,000 or 14,000 feet elevated, were snowed up for three or four months in the year. There was also a good pass nearly opposite to Conception, of much lower elevation, but interrupted not only by snow for a great part of the year, but by incursions of the Araucanian Indians.

However, supposing the intervening distance of two or three hundred miles between the 6000 and 16,000 feet levels, to which he had referred, presents insuperable obstacles to the construction of a railway, that portion of the route could easily be crossed by a good waggon road; and such a communication, with the addition of *telegraphic wires*, would be of the greatest possible advantage to the inhabitants of Peru and Chile, of the immense plains to the east of the Andes, and of the whole of Brazil, besides the advantages it would create for the extensive and great intercommunication that would be developed between Australasia and South America. The actual distance from New Zealand, across that part of South America, to Europe, was rather less than the distance by the Isthmus of Central America: and there was another consideration connecting Australasia intimately with Chile, namely—a ship running a few hundred miles to the north from Copiapo, or Caldera, got into the heart of the trade wind, which would carry her across to Australasia. On the other hand, by running a little to the south from Australia or New Zealand, a ship would get into the south-westerly winds, which would carry her right across to Chile; so that a ship without steam might make the voyage either way in five or six weeks, without having to guard against intervening land, or peculiar danger of any kind, beyond that of an oceanic passage without a hurricane. The question was now in the state at which it well became the Geographical Society to investigate it, and ascertain whether the data put before them were correct, before the project passed into the hands of capitalists who might be disposed to invest large sums of money upon perhaps insufficient information, and be led astray by the plausible assertions of persons themselves mistaken. It seemed to be the honourable duty of the Geographical Society to collect information respecting such great questions, and lay it before the public, in order that those who had capital to employ might embark in the undertaking with more security.

CAPTAIN SULIVAN, R.N., F.R.G.S., observed, that vessels of 14 feet draught of water could go up the La Plata to Rosario during the greater part of the year, and those of 12 feet at all times. He had taken vessels of 16½ feet much beyond Rosario, when the river was high. Another advantage was, that the effect of the wind in raising the water of the La Plata sometimes reached as high as Rosario; so that vessels would not be delayed for any length of time by a low river, as they are higher up the Parana. Any one who had been in that country and seen the troops of waggons drawn by oxen coming to Buenos Ayres from the upper provinces must be aware of the large traffic that a railway would open up with the interior. There was only one thing that Mr. Wheelwright had, perhaps, understated and that was the length of the voyage from England to Rosario. Instead of twenty-five days, as that gentleman stated, he thought thirty days at least should be allowed.

MR. W. BOLLAERT, F.R.G.S., wished to direct attention to the circumstance that the pass in the Cordillera would seldom be closed up at an elevation of 16,000 feet, because there was so little moisture in the atmosphere. He had been as high as between 17,000 and 18,000 feet on the Andes to the north of Copiapo, and there was very little or no snow to be seen. The trade winds deposited nearly all their moisture before they reached that region, which was probably the principal cause of the desert country west of the Andes.

MR. W. J. HAMILTON, F.R.G.S., had listened with great interest to the paper, but he confessed he thought it ought rather to have been laid before the Institution of Civil Engineers or the Statistical Society. Although many of the observations in the paper bore upon the physical geography of the country, yet its principal object appeared to be directed to the feasibility of carrying railway communication across the Andes. The impression left upon his mind was, that however practicable it might be to construct a railway across the pampas and plains of South America on the eastern side of the Andes, the enormous elevation of 16,000 feet would render it perfectly impracticable to carry the line over the mountains. The average estimate of gradients mentioned in Mr. Wheelwright's paper was 200 feet per mile, which would give about 1 in 30 as the ruling gradient of the line. He believed that was a gradient which at present must be considered almost impracticable for locomotive engines. On the western coast of India there was a line of railway now constructing, with a gradient of 1 in 37, and it was considered a triumph of engineering skill. He believed 1 in 40 was the steepest gradient which had yet been overcome in Europe.

ADMIRAL FITZROY said the gradient of 1 in 30 referred to was an isolated instance, for a short distance only. It was the steepest gradient on the line. Steeper gradients than 1 in 30 had been overcome in Norway and America by engines with ten wheels—four driving-wheels and six others. They had surmounted gradients of 1 in 25, and even 1 in 23; therefore a gradient of 1 in 30 could not be considered impracticable. Moreover, stationary engines might be used for limited distances, besides inclined planes, assisted by descending weights of mineral from high elevations.

The CHAIRMAN could hardly agree with Mr. Hamilton in considering that this was a topic which the Geographical Society could not entertain. On the contrary, he thought, with Admiral FitzRoy, that the Society was bound to entertain projects of such vast importance.

GENERAL J. E. PORTLOCK, F.R.G.S., thought it right to correct a small error which had been made. It had been observed that 200 feet in a mile was in the proportion of 1 in 30. The English mile, composed of 5280 feet—not the geographical mile—being that used in engineering calculations, 200 feet in a mile would be a little less than 1 in 26½. This fact was noticed with a view of putting the question on the most fair ground, as 1 in 26½ feet is so nearly the same as 1 in 25, stated by Admiral FitzRoy to have been about the steepest slope effected in American railways. The work, therefore, is doubtless one of great difficulty, but, in the opinion of General Portlock, by no means insuperable.

MR. HAMILTON explained that he had taken the nautical mile of 6000 feet. According to General Portlock's calculation, the difficulty would be even greater than he had estimated.

The second Paper read was—

2. *The Curia Muria Islands.* By GEORGE BUIST, LL.D., COR. F.R.G.S., &c.

THIS group, from its many peculiarities always interesting, physically considered, but which might, if presenting no farther claims than this on our attention, have continued neglected as before, has of late become famous from the treasures of guano it was alleged to contain, and from the large sums of money expended with the view of securing these and turning them to account. Though the manure is only found on two of the smallest of the group—Jebeliyah and Hasiki—it was computed to amount, when they were examined in 1852, to 200,000 tons, and it is asserted that 45,000 tons have, up to the end of 1858, been exported. In the beginning of the last-named year there were some 50 vessels at anchor off the islands, of a total freight of probably 45,000 tons. In September, 1857, I saw at Aden 27 vessels destined for the Curia Murias, and freight to the extent of 80,000 in all has probably visited them within the past three years. A man-of-war has generally been in attendance as a survey or guard-ship, and probably not less than a quarter of a million sterling has, within four years, been expended on this adventure.

The officers of the Indian navy are conducting an extended and minute survey of the islands, and will doubtless present us with charts, characterised by the minuteness and accuracy which have hitherto distinguished the labours of that body. Captain Pullen, of